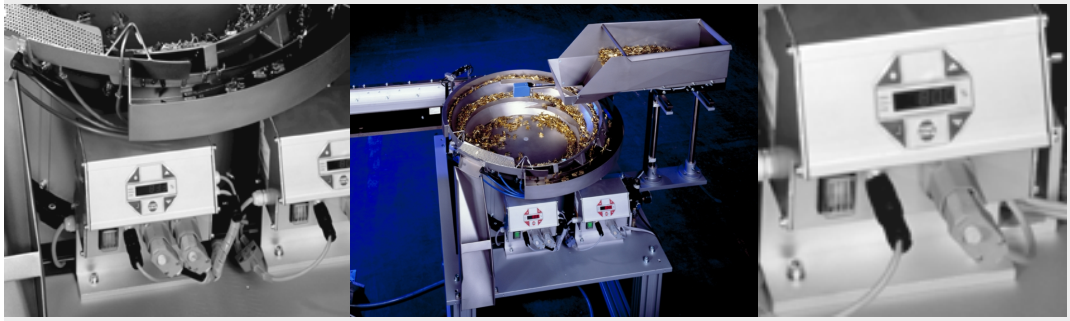

Operating Instructions for the Control Units of Vibratory Drives

ESK 2002

BA

Rhein-Nadel Automation GmbH

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Declaration of conformity
as defined by
Low voltage directive 2006/95/CE
and EMC directive 2004/108/CE

Herewith we declare that the product complies with the following provisions:

Low voltage directive 2006/95/CE
EMC directive 2004/108/CE

applied harmonized standards:

DIN EN 60204 T1
EN 60439-1

remarks:

Rhein-Nadel-Automation

Managing Director
Jack Grevenstein

CE

1.1 Performance Characteristics

This compact control unit has been designed to operate a vibratory bowl feeder, a linear feeder and a hopper combination. It can connect a linear feeder or delivery belt to Channel 3 and a vibrating hopper or belt hopper to Channel 2. The belt drives have to be equipped with an AC capacitor motor.

Control unit ESK 2002-10 manages a total output of 10 amps and control unit ESK 2002-16 a total output of 16 amps. The unit has the following performance characteristics:

- Three power outputs:
  Channel 1: vibratory bowl feeder < 10 A (10A)
- Channel 2: linear feeder or hopper < 4 A (6A)
- Channel 3: linear feeder or hopper < 4A (6A)
- Total load current max. 10 A (16A)
  Channels 1 to 3 are phase controlled
- Two sensor amplifiers with independently adjustable time levels (Incoming / Outgoing)
- External 24VDC enabling inputs
- Two relay outputs and four optocouplers for status messages and further links
- A membrane keyboard for setting and changing the operating values (parameters) in the setting menus.

- Plug connections for
  - vibratory bowl feeder
  - linear feeder
  - hopper
  - sensors
  - communication
- Double-pole mains power switch

1.2 EC Conformity /CSA Conformity

The control device corresponds to the following regulations:

Low voltage directive 2006/95/CE
EMC directive 2004/108/CE

Applied harmonized standards:

DIN EN 60204 T1
EN 60439-1

1.3 Technical Data

Mains voltage:	230 Volt AC, 50/60 Hz, +20 / -15% 110 Volt AC, 50/60 Hz, +10 / -10%
Output voltage:	0 ... 208 V_{eff} / 230 VAC ; 0 ... 98V_{eff} / 110VAC
apparatuses type:	**ESK 2002 - 10 / ESK 2002 - 16**
Load current channel 1:	10 A_{eff} / 10 A_{eff} /
Load current channel 2:	4 A_{eff} / 4 A_{eff} /
Load current channel 3:	4 A_{eff} / 4 A_{eff} /
Total load current:	10 A_{eff} / 16 A_{eff} /
Minimum load current:	80 mA
Internal fuse:	F1 = 10A / F2 = 4A / F3 = 4A
Soft start time, soft stop time for three channels:	0 ... 5 sec., separate selectable
Sensor inputs:	2
3 Remote controls input:	24V DC (10-24VDC)
Sensor power supply:	24V DC, max. 60 mA (per sensor input)
Sensor delay ON:	0 ... 60 sec. can be selected separately
Sensor delay OFF:	0 ... 60 sec. can be selected separately
Outputs:	2 relays / 2 normalty open contacts voltage-controlled 2 potential-free change-over contact
Status output (optocoupler):	max. 30V DC 10mA
Relay contacts:	max. 6A 250V AC
Operating temperature:	0 ... 45° C
Type of protection:	IP 54

1.4 Accessoires

Label	Denomination	RNA-Mat-code
XS1,XS2,XS5	Connector, 5-poles	31002322 (50Hz Antriebe) 31002323 (100 Hz Antriebe)
XS3	Coupler connector, 5-poles, straight	35051144
XS3	Coupler connector, 5-poles, angular	35002546
XS4	Coupler connector, 12-poles, straight	35051641
XS4	Coupler connector, 12-poles, angular	35051642

2 Safety Instructions

It is always necessary to read and understand the safety instructions. This ensures that valuable material is not damaged and injuries are avoided.
Steps must be taken to ensure that all persons working with this control unit are familiar with the safety regulations and observe them.
The device described in this manual is a control unit for operating RNA bowl feeders and linear feeders. The limit values specified in the technical data must be observed.

Note!
This hand indicates tips on operation of the control unit.

Attention!
This warning triangle indicates safety instructions. Failure to heed this warning can lead to severe injuries or death!

Work on electrical equipment of the machine/plant may be carried out only by a trained electrician or by untrained persons under the leadership and supervision of a trained electrician in accordance with the regulations for electrical engineering!

All safety and danger signs on the machine/plant must be observed!

The electrical equipment of a machine/plant must be inspected and checked regularly. Defects such as loose connections or damaged cables must be remedied immediately!

Before commencing operation, make sure that the earthing line (power earth, PE) is intact and installed at the connecting point. Only test instruments approved for this purpose may be used for checking the safety grounding conductor.

3 Commissioning Instructions

Before connecting up to the mains and switching on the control unit, it is essential to check the following points:

- Is the control unit in proper working condition and closed with all screws?
- Are the connector locks clicked in/screwed secure?
- Are all cables and glands intact?
- Is PROPER INTENDED USAGE ensured?
- Does the mains voltage specification on the control unit agree with the local mains voltage?
- Does the mains frequency specification on the vibratory drive agree with the local mains?
- Is the correct operating mode set on the control unit? (See "Operating Mode" section)

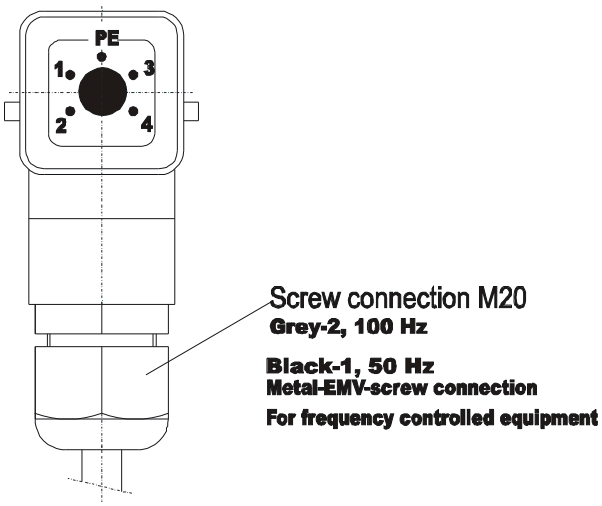
Operation of the control unit may be commenced only when all questions asked above can be answered unambiguously with YES.

Before you start operation after repair work has been carried out or control units/vibrating drives have been exchanged, set the output on the control unit to minimum before switching on. Check that the system is working properly when you increase the output.

3.1 OPERATING MODE

Bowl feeder frequency coding in connector.
Operating mode 2
With bridge: 100 / 120Hz
With bridge: 6000 / 7200 oscillations/min

Operating mode 1
Without bridge: 50 / 60Hz
Without bridge: 3000 / 3600 oscillations/min



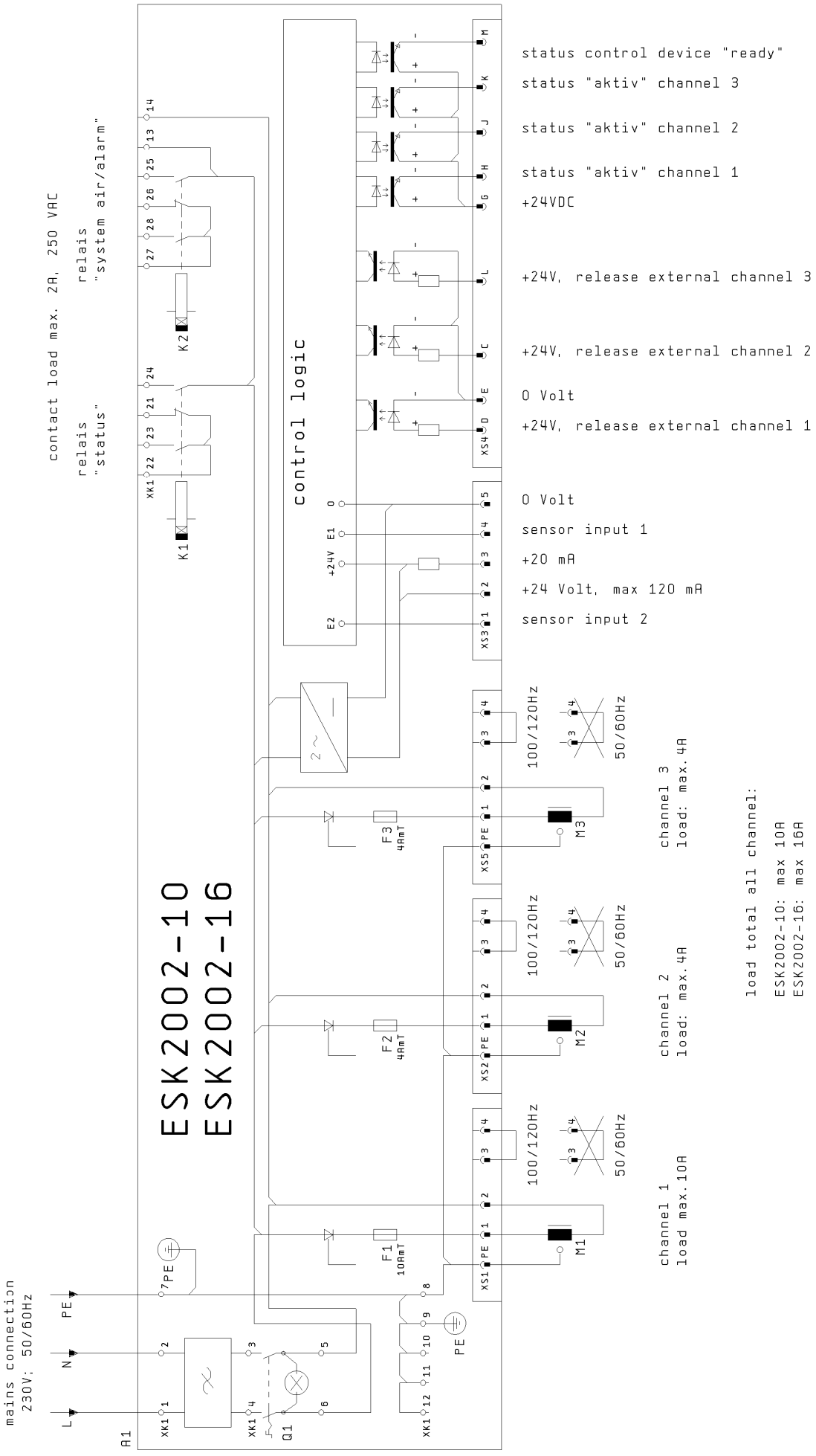
3.2 Sensor Inputs and Sensor Links

The control unit has two built-in sensor inputs. They can be used for checking the back pressure, the level, for cycle control and other monitoring functions. The following basic rules apply:

Sensor input 1 acts on channel 1. In case nothing else has been programmed in menu C006, sensor input 1 acts on chanel 1 and sensor input 2 acts on channal 2. If the operation level control is needed, therefore the sensor input 2 is reserved. The sensor inputs can only be evaluated when they are activated. See the connecting diagram for the sensor connections (XS3 plug connection).

3.3 Status Outputs and Relays

The status outputs are used for remote diagnostics of the control unit operating mode or for linking several control units together. They are unassigned NPN-doped transistor routes and are potential-free.
The transistor route is always connected at the **STANDBY** status output when the control unit is connected to the mains and switched on with the mains power switch.
The **ON ACTION** status output requires the same conditions as STANDBY. Additional Channel 1, channel 2 and channel 3 must be active. The transistor will block if it is set to BACK PRESSURE, OFF or STOP. The status outlets and the remote control should be wired via the XS4 plug connection.


mains connection
230V; 50/60Hz
L
N
PE
A1
XK1
Q1
F1
10AmT
F2
4AmT
F3
4AmT
PE
ESK2002-10
ESK2002-16
control logic
XS1
XS2
XS5
M1
M2
M3
100/120Hz
50/60Hz
channel 1
load max.10A
channel 2
load: max.4A
channel 3
load: max.4A
load total all channel:
ESK2002-10: max 10A
ESK2002-16: max 16A
contact load max. 2A, 250 VAC
relais
"status"
relais
"system air/alarm"
K1
K2
XS3
XS4
+24V
E1
E2
status control device "ready"
status "aktiv" channel 3
status "aktiv" channel 2
status "aktiv" channel 1
+24VDC
+24V, release external channel 3
+24V, release external channel 2
0 Volt
+24V, release external channel 1
0 Volt
sensor input 1
+20 mA
+24 Volt, max 120 mA
sensor input 2

4. Operation

4.1 General

Control unit plug connections

Mains power switch	**The control unit is isolated from the mains with a double-pole switch.**
XS 3	**Plug connector for sensors**
Channel 1	**Plug connector for bowl feeder (< 10A)**
Channel 2	**Plug connector for vibration feeder or 1-phase motor (< 4A)**
Channel 3	**Plug connector for vibration feeder or 1-phase motor (< 4A)**
XS 4	**Plug connector for optocoupler outputs and remote control input**

The control unit display (membrane keyboard)

On/off
This key switches all connected devices off. "OFF" will appear in the display. The control unit is still ready for operation.

Cursor up and cursor down
Use these keys to page through the control unit menu or to set parameters.

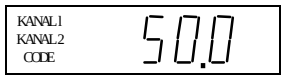
Enter
Use this key to confirm the parameters entered with the cursor.

Decimal point in display
If the decimal point is not flashing, you cannot make an entry.

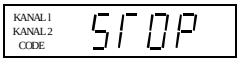
If the decimal point is flashing, you can make an entry.

4.2 Switching on the Control Unit

Switch on the control unit with the mains power switch. The main menu will appear in the display showing the last set-point set in channel 1 (bowl feeder feed rate).

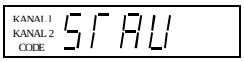


The following displays may also appear depending on the circuit state of the unit.



The remote control has been activated but is currently not available on the unit. (middle priority)

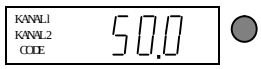
The unit has been switched off with the upper left-hand key on the membrane keyboard, all functions are blocked.
(high priority)



The back pressure control sensor has been assigned thus switching off channel 1 (bowl feeder).(low priority)

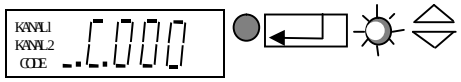
4.3 Main Menu/Setting and Displaying Setpoints for Channel 1, Channel 2 and Channel 3

Display of setpoint or the channel 1 output (vibratory feeder) Alternatively: STOP, OFF or BACK PRESSURE (see above)



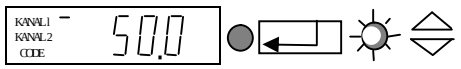
No entries possible

Enter code to change or make required settings.



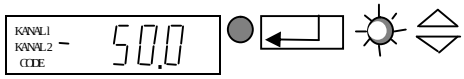
Enter code.
See section 4.4 for description of code.

Setpoint preset for channel 1 (bowl feeder)



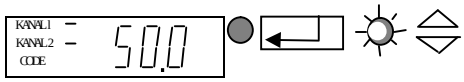
Entry in %; return to display mode to store

Setpoint preset for channel 2 (vibrationunit or 1-phase motor)



Entry in %; return to display mode to store

Setpoint preset for channel 3 (vibrationunit or 1-phase motor)



Entry in %; return to display mode to store

From these four basic displays you can page through the main menu using the cursor keys (UP/DOWN). Press the ENTER key in the main menu to activate a menu item for setting or adjustment. The decimal point will flash once you have pressed the ENTER key. Changes can now be made using the cursor keys (UP/DOWN). Confirm the entries by pressing the ENTER key again. The decimal point will no longer flash. You can scroll further through the menu using the cursor keys. This procedure is also used in the code menus described below.

All displays shown in the following section represent the factory settings. If the actual display on the control unit differs, the factory setting has been changed in the individual codes for a specific application.

4.4 Description of the Individual Codes for Programming the Control Unit

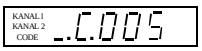
Settings for channel 1
The following functions can be set or limited for channel 1 in this submenu:
- vibration amplitude
- signal direction of the remote control
- remote control
- soft start time and soft stop time

Settings for channel 2
The following functions can be set or limited for channel 2 in this submenu:
- vibration amplitude
- signal direction of the remote control
- remote control
- soft start time and soft stop time
- selection Vibrationhopper or Belthopper with 1-phase motor

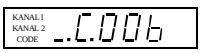
Settings for channel 3
The following functions can be set or limited for channel 3 in this submenu:
- vibration amplitude
- signal direction of the remote control
- remote control
- soft start time and soft stop time
- selection Vibrationhopper or Belthopper with 1-phase motor

Lock setpoint
This submenu allows the setpoints (vibration amplitude) to be blocked in the main menu. The setpoints for channel 1, channel 2 and channel 3 can no longer be changed in the main menu. This prevents the output values being accidentally changed. Changes can only be made using code C001, code C002 and C012.

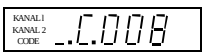
Setting sensor input 1
Sensor input 1 is activated in this submenu. The following functions can also be set.
- invert input signal direction
- time before switch-on
- time before switch-off



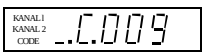
Setting sensor input 2
Sensor input 2 is activated in this submenu. The following functions can also be set.
- invert input signal direction
- time before switch-on
- time before switch-off



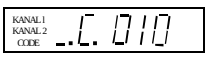
Selecting the sensor links
The sensors activated with codes C004 and C005 can be linked to each other in this submenu.



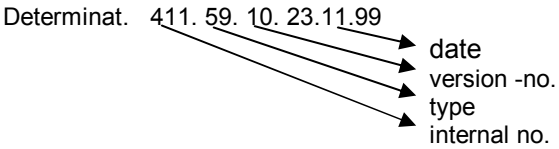
Setting the cycle control
Set the sensor input to be monitored and how the control will react when there is a fault.

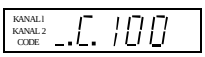


Display status
This submenu is used to check the set vibration frequency and the sensor inputs.

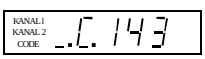


To call software version

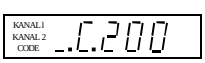




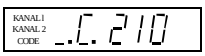
Output preset with an external voltage



Store parameters
If the values (user parameters) previously set in the different submenus are to be stored, call this submenu.



Block all setting functions
This code blocks all entry options on the control unit. The values can no longer be changed. The menu can now only be enabled using this code.

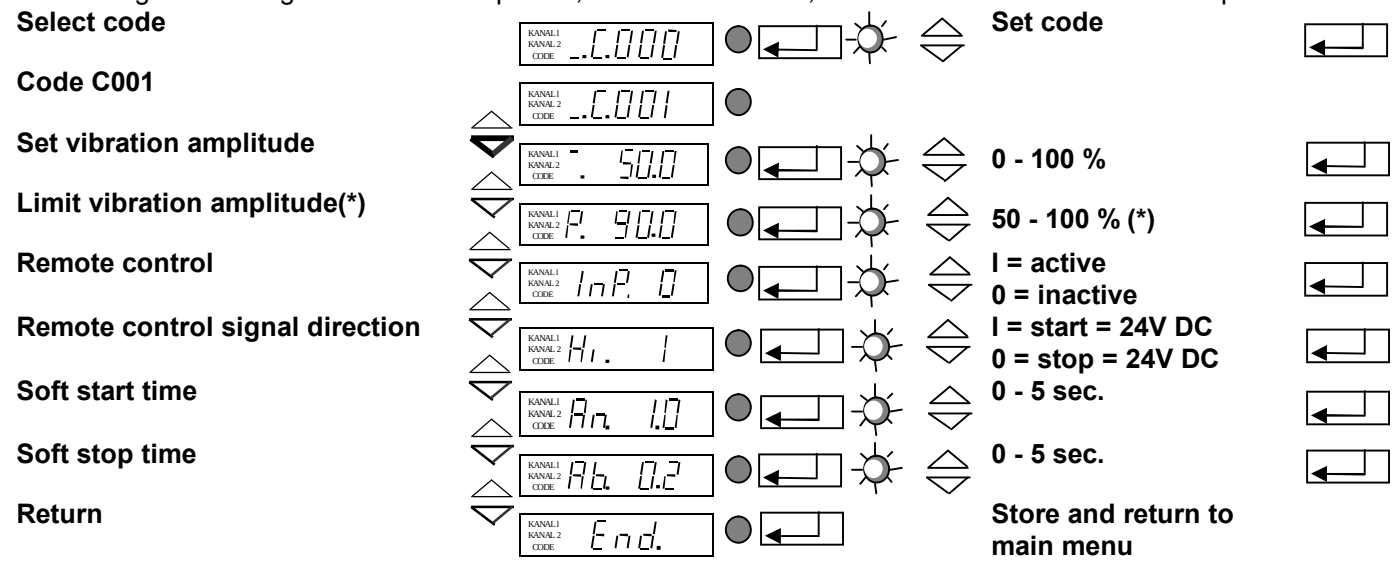


Reset parameters
This submenu allows the user to reset the control unit to the factory settings. If user parameters have been stored, the control unit can also be set to these settings.

4.5 Application-specific Changes to the Factory Settings

4.5.1 Code C001 for Channel 1 (power output 1)

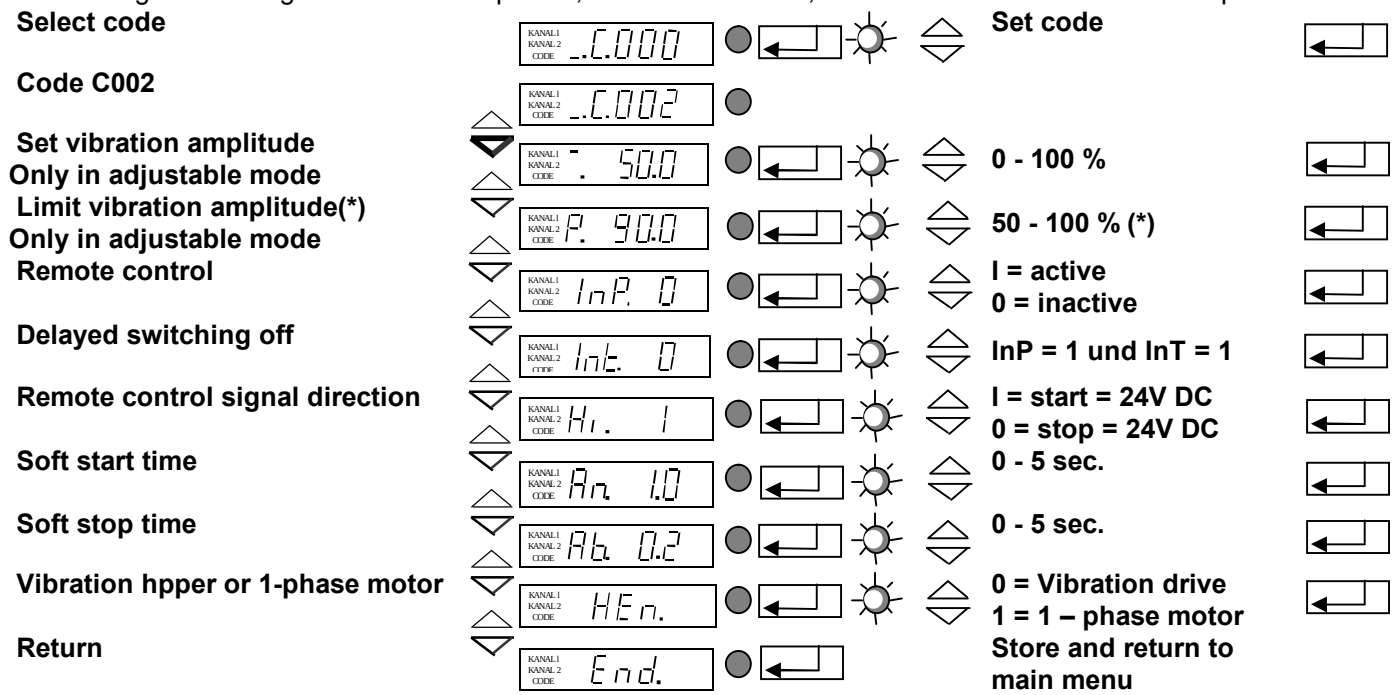
Aim: Setting and limiting the vibration amplitude, the remote control, the soft start time and the soft stop time.



☞ * RNA-Feeder with 200 V = 90 %

4.5.2 Code C002 for Channel 2 (power output 2 Vibration hopper or belt hopper)

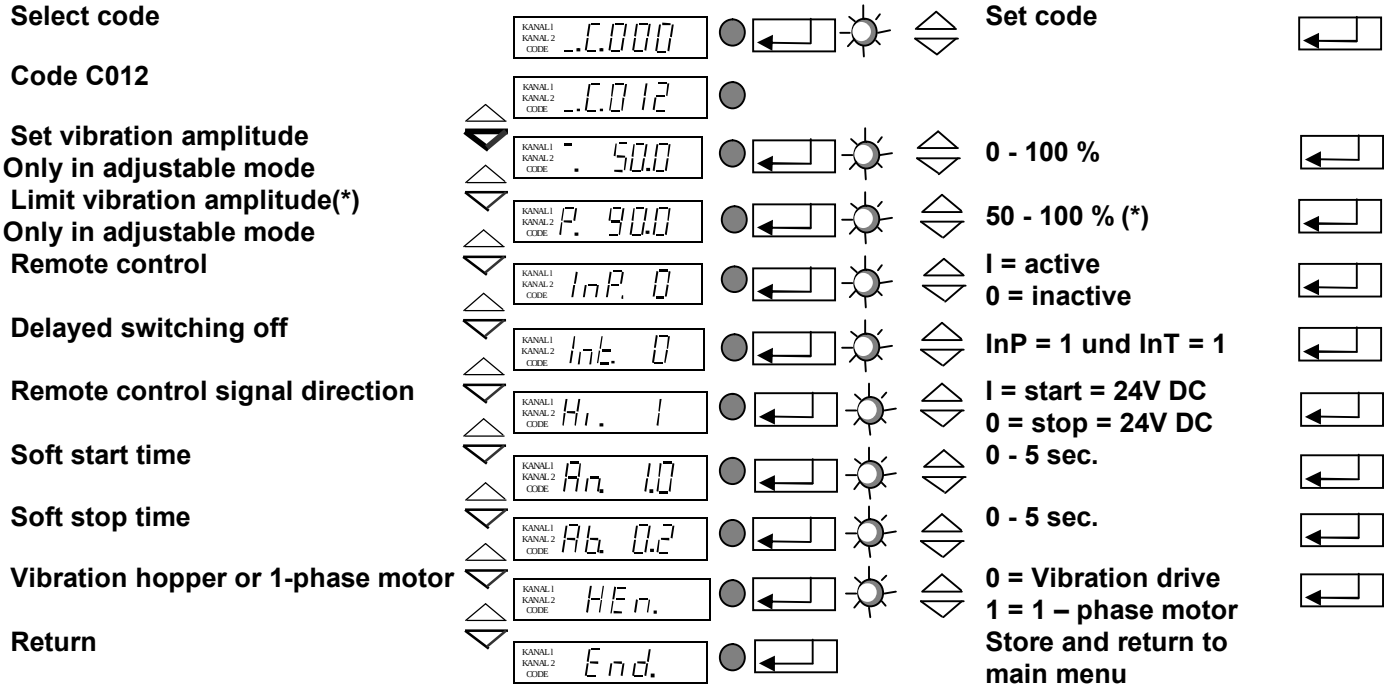
Aim: Setting and limiting the vibration amplitude, the remote control, the soft start time and the soft stop time.



☞ * RNA-Feeder with 200 V = 90 %

4.5.3 Code C012 for Channel 3 (power output 3, Vibration outlet or belt outlet)

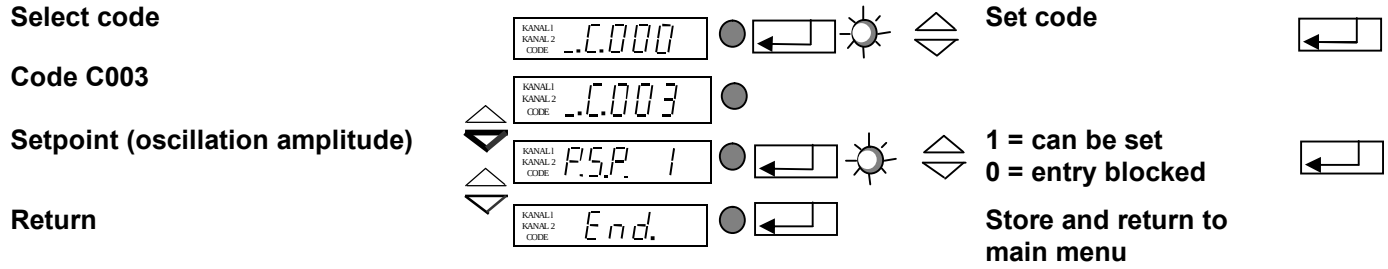
Aim: Setting and limiting the vibration amplitude, the remote control, the soft start time and the soft stop time.



☞ * RNA-Feeder with 200 V = 90 %

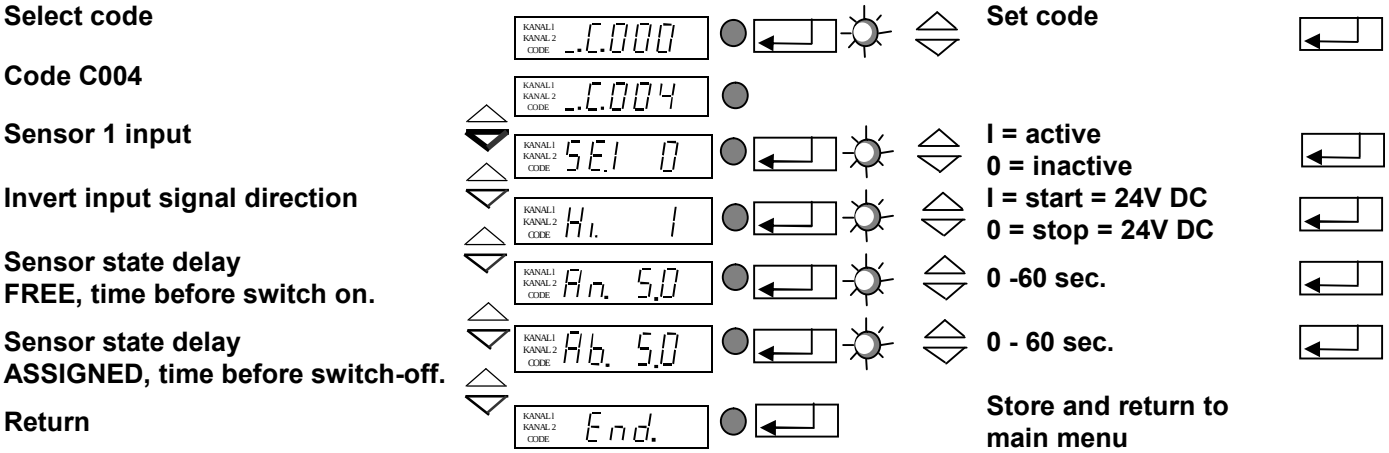
4.5.4 Code C003 Lock Setpoint

Aim: Blocking the setpoints in the main menu. The values can no longer be changed directly. Changes can only be made using code C001, code C002 and code C012.



4.5.5 Code C004 Sensor Input 1 and Code C005 Sensor Input 2

Aim: Activating and setting the sensor inputs

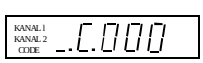


☞ Code **C005** is used for sensor input 2 in the same way.

4.5.6 Code C006 Sensor Links

Aim: Linking two previously activated sensor inputs.

Select code

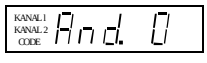


set code

Code C006

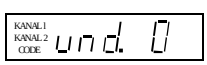
☞ **Only one of the eight sensor links can be set active.**

And (und) link with blow-off of the outlet tracks



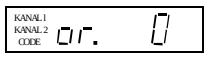
1 = active
0 = inactive

And (und) link without blow-off of the outlet tracks



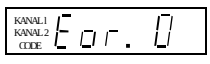
1 = active
0 = inactive

Or link



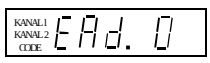
1 = active
0 = inactive

Min/Max link



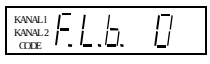
1 = active
0 = inactive

And / S2 link



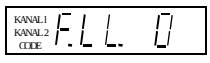
1 = active
0 = inactive

Level control with external control



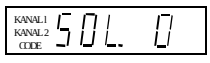
1 = active
0 = inactive

Level control Signal lamp



1 = active
0 = inactive

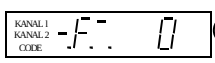
Single link



1 = active
0 = inactive

☞ **With the following two sensor links, it is possible to set the priority of both chanels**

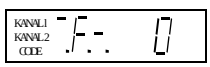
Channel 2 follows chanal 1



1 = activ
0 = inactiv (both channels work independent)

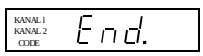
☞ **or !**

Channel 1 follows channel 2



1 = activ
0 = inactiv (both channels work independent)

Return



Store and return to the main menue

A brief description of the individual links

☞ **And (UND) link of the two sensor inputs with blow-off of the outlet tracks.**
Example:

Application: **Two-track feeding system with back pressure control**

Solution: **Track 1 (Sensor 1) full = blow-off track 1 (Relais K1)**
Track 2 still free
Track 2 (Sensor 2) full = blow-off track 2 (Relais K2)
Track 1 still free
Track 1 + Track 2 full = bowl feeder (channel 1) stop blow-off air after approx. 4 sec

☞ **And (UND) link of the two sensor inputs without blow-off of the outlet track.**
The bowl feeder (channel 1) switches off, if both sensors are assigned. The air for sorting may be de-energizes later (4 sec) through relay K2.

☞ **And / S2 link**
The bowl feeder (channel 1) switches off, when both sensors are assigned. When the sensor 2 is free, the system is switched on. The air for sorting can be switched off later through relay K2.

☞ **Or/ link of both sensorinputs**
The bowl feeder (channel 1) switches off, when one of the **sensors** is **assigned.** The **air for sorting can be switched off later (4sec) through relay K2.**

☞ **Min/Max Connection of both sensor inputs**

The bowl feeder switches of, when both sensor inputs are assigned. When both sensors are free, the bowl feeder (channel 1) switches on. Relay K1 switches with switching off of the bowl feeder. Relay K2 switches 4 sec later (Blow-off switching)

☞ **Level control for the hopper with external control**

Sensor 2 switches relay K1 according to the entered delay time (C005). When the sensor 1 is darkened, relay K1 releases (looking of the hopper).

Application: Sensor 1 = back pressure control
Sensor 2 = level control
Relay K1 = hopper control

☞ **Level control for signal lamp**

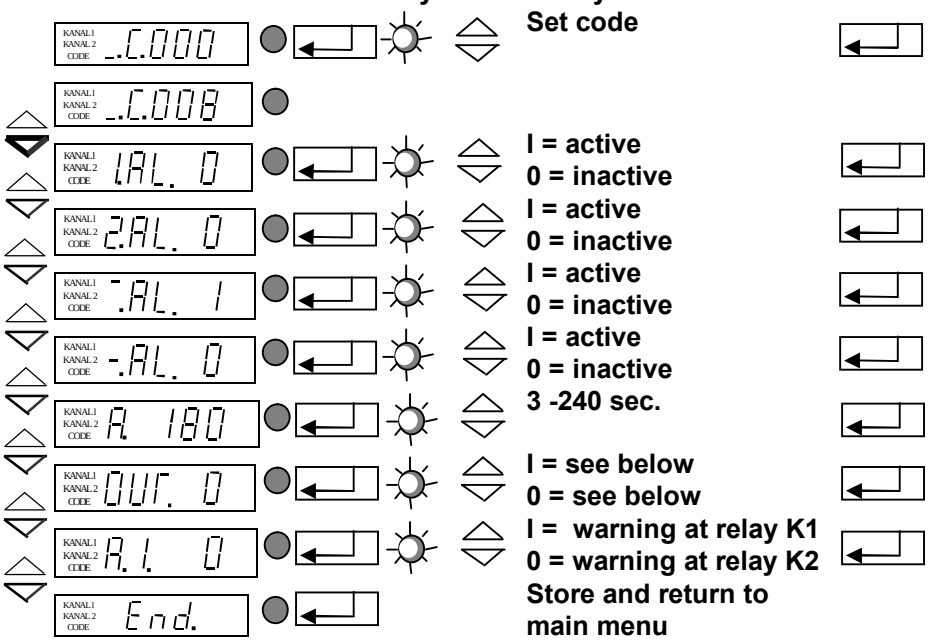
Sensor 2 switches relay K1 according to the entered delay time (C005), without consideration of sensor 1 (Back pressure control).

Application: Sensor 2 will be used as a level control (e.g. LC-N 24V DC). Relais K1 switches with a signal lamp: *Bowl feeder empty*.

4.5.7 Code C008 Cycle control

Aim: Control sensors 1 (back pressure control) and/or 2.

The links "AND; SOL" must not be activated in code C006 when the cycle control system is activated.



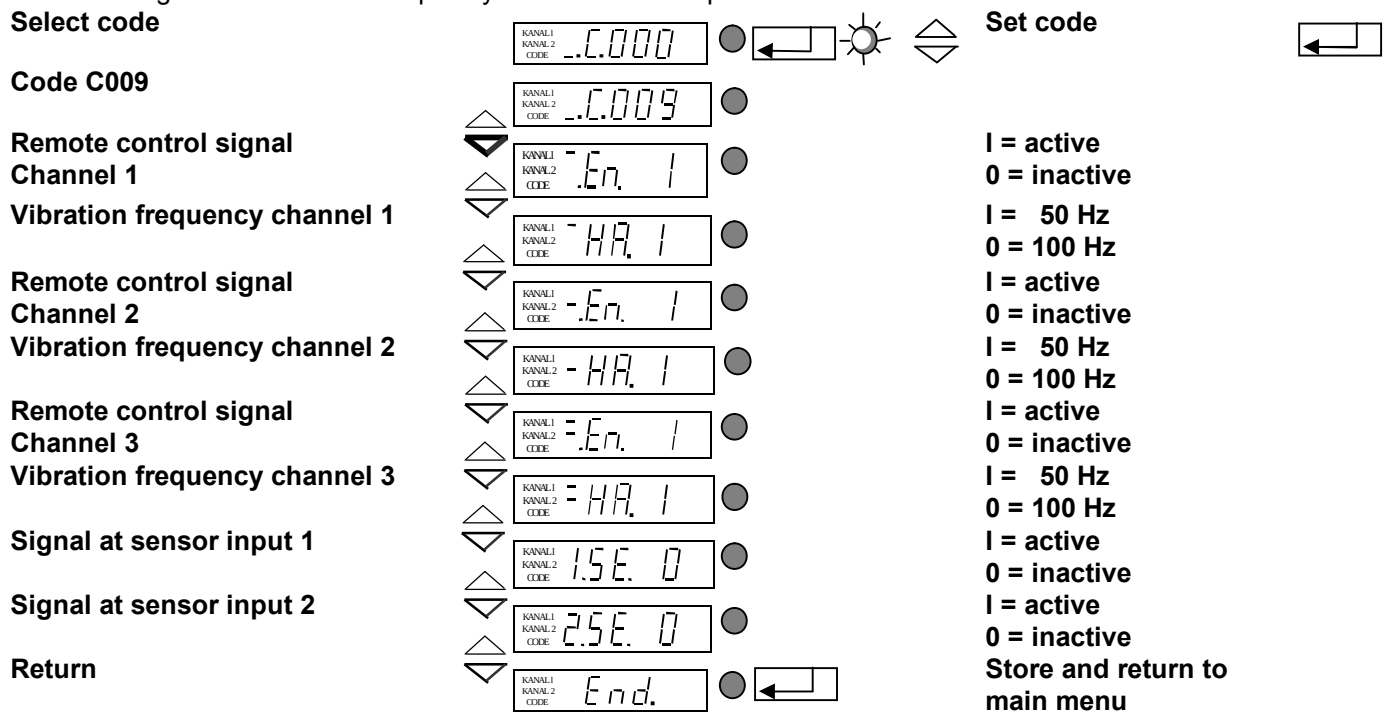
☞ **The cycle monitoring system monitors the FREE sensor state. The time (A 180) is used to set the maximum time which a sensor may be free before an alarm signal is issued.**
Relay K2 is picked up when an alarm signal is issued. The fault is cleared by covering the sensor.

☞ **If OUT = 1 and a fault occurs, the bowl feeder will also be switched off in addition to relay K2 (indicator lamp: fault) and an ERROR message will appear in the display. The fault is cleared with the cursor key at the bottom right.**
If OUT = 0 and a fault occurs, only relay K2 is energized (indicator lamp: fault). The fault is cleared automatically when sensor 1 is assigned.

☞ **If A.I. = 1 Relay K1 is checked on breakdown (switch changed over from relay K2 to K1)**

4.5.8 Code C009 Display Status

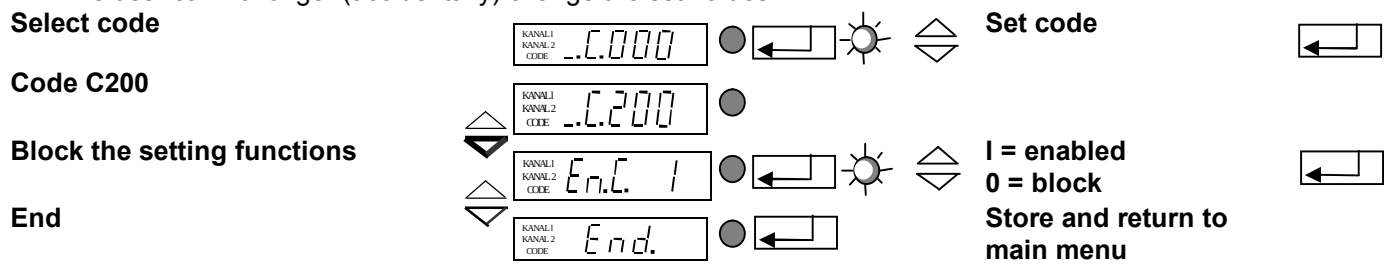
Aim: Checking the set vibration frequency and the sensor inputs.



With the menu item HA = half-wave you can check whether the operating mode (100 – 50Hz) has been correctly selected.

4.5.9 Code C200 Blocking all Setting Functions

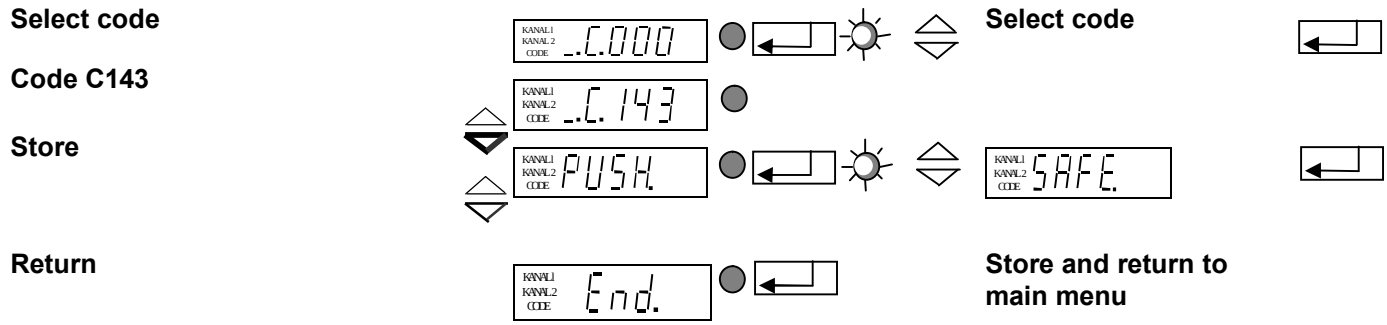
Aim: The user can no longer (accidentally) change the set values.



Now only code C200 will be accepted!!!
It is possible to change the setpoint for chanel 1 and 2 and 3 in the main menu (see 4.3)

4.5.10 Code C143 Store Parameters

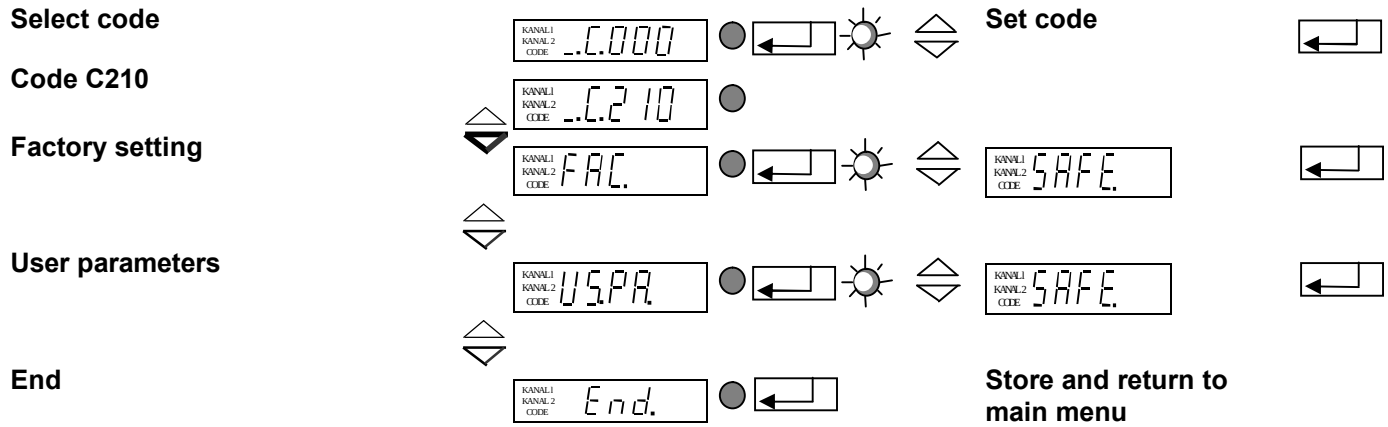
Aim: Storing user parameters.



Once PUSH has been confirmed with ENTER, the selected parameters will be stored separately by pressing a cursor key.

4.5.11 Code C210 Reset Parameters

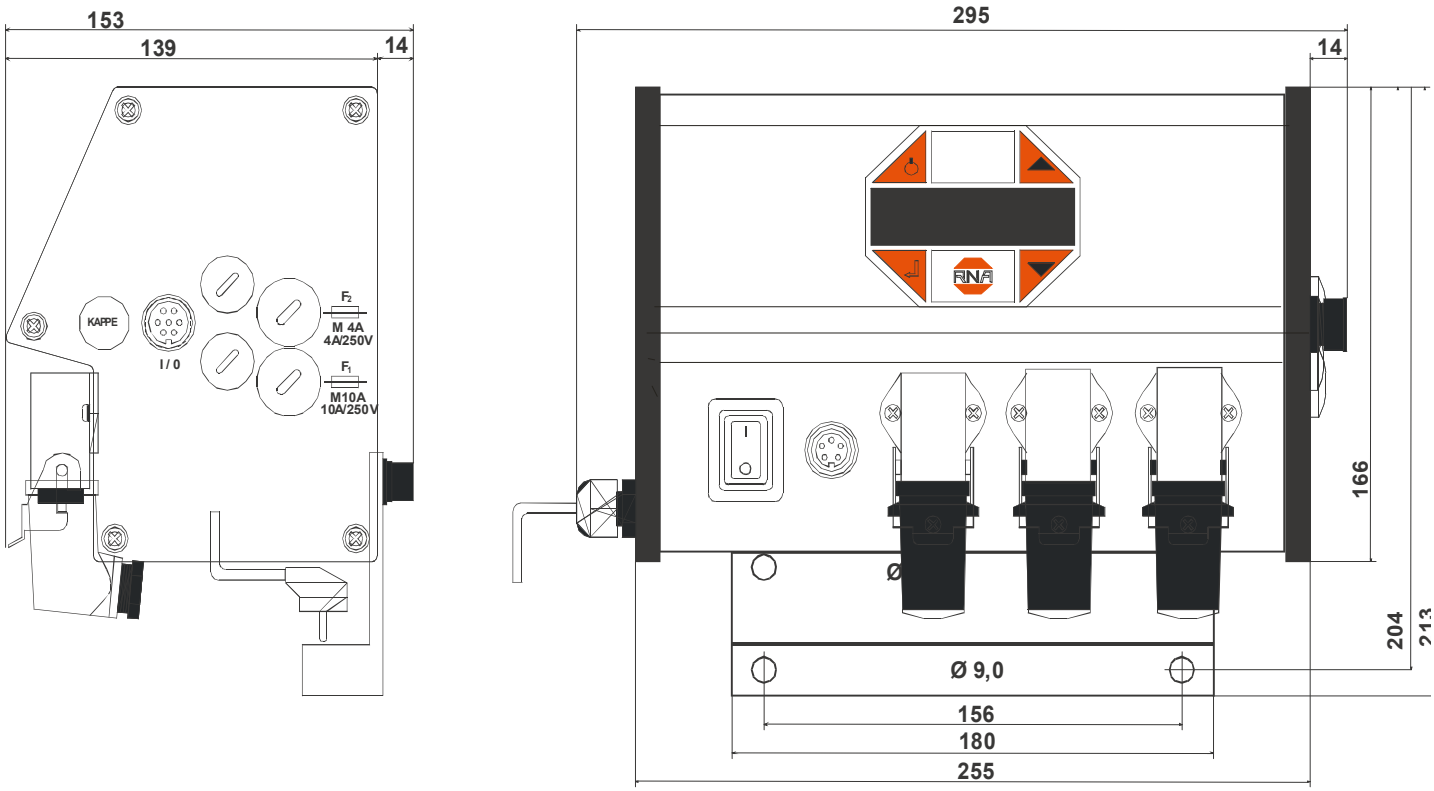
Aim: Resetting to factory settings or restoring the stored user parameters.



FAC Selection and confirmation of FAC. applies the factory settings.

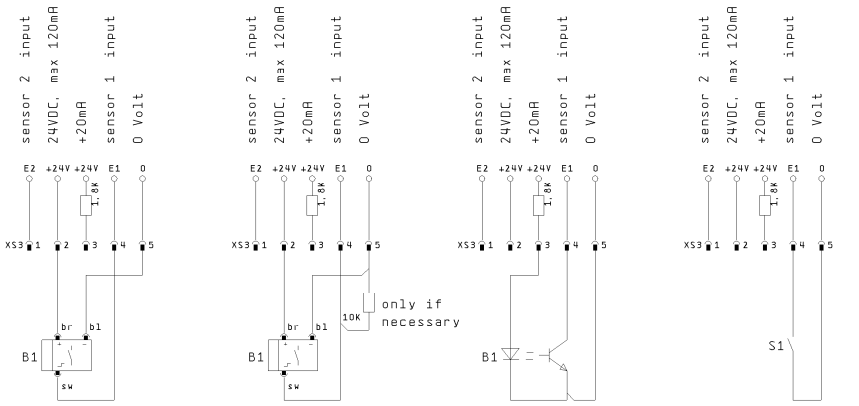
US.PA. Selection and confirmation of US.PA restores the user parameters previously stored under C143.

5 Scale Drawing



Connecting Diagram

sensor connection at XS3 for control units
ESG2000, ESK2000, ESK2001, ESK2002, ESR2000

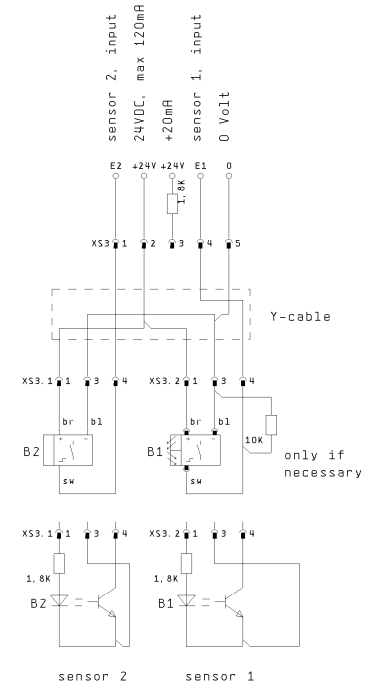


proximity switch
normal
NPN

proximity switch
normal
PNP

optically sensor
without amplifier
(EGF40)

potencial free
contact



connection of 2 sensors

D

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